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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/808,472	03/14/2001	David M. Pepper	B-3807 617493-8	3552

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EXAMINER
GLASS, CHRISTOPHER W

ART UNIT	PAPER NUMBER
2878	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/808,472	PEPPER ET AL.	
	Examiner	Art Unit	
	Christopher W. Glass	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-13 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. Claims 16 and 20 are objected to because of the following informalities: in lines 1-2 of claim 16, one of the two back-to-back instances of "two exiting optical components" should be removed. In claim 20, colons and/or commas should be used to more clearly differentiate the limitations contained in lines 3-7 of part (e), which correspond to lines 10-14 of the whole claim. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-12 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,131,748 to Monchalin et al. (hereafter Monchalin), in view of U.S. Patent No. 5,894,531 to Alcoz.

Regarding claims 1,4, and 14: Figure 3 of Monchalin discloses an optical apparatus for coherent detection of an input optical beam, comprising a beam splitter **104** for splitting the input optical beam **100** (from laser **102**) into a first component **100a** and a second component **100b**, the optical beam having information content with a minimum signal frequency component. An

adaptive beam combiner **20** has two exiting optical components **114',116** having the same wavefronts and propagating directions as the first and second components. A detector arrangement having detectors **124** and **126**, as well as cube polarizer **122** is shown, for receiving and detecting the first and second exiting components from the adaptive beam combiner. Monchalin does not expressly disclose an optical delay device arranged to receive the second component, and which imposes an intentional delay in the second component of the optical beam. Further, the two exiting optical components **114',116** are not expressly taught as being in quadrature. However, it is well known in the art to use optical delay devices in such systems, to obtain ideal phase relationships between two optical beams. Figure 1 of Alcoz shows a fiber optic interferometer utilizing a multi-mode delay optical fiber **5** for imposing a delay in one beam path between beam splitter **4** and combiner **6**. Figure 2 shows a functionally equivalent configuration which uses a delay path of beam splitters/combiners instead of a delay fiber loop; path **3,4,5,6**, in Figure 2 of Alcoz, imposes a delay in one of the two beam paths, which are split by element **3** and combined by element **4**. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide such a delay device to either beam path **100a** or **100b** in the system of Monchalin shown by Figure 3, in order to control the phase relationship between the beams and to ensure that they are in quadrature.

Regarding claim 2: In the Figure 3 embodiment of the optical apparatus of Monchalin, the input optical beam **100** is provided from a source comprising: a probe laser **102**, a workpiece under test (with surface **16**) which is subjected to an ultrasonic excitation pulse, and a beam director **104** for receiving a laser beam from the probe laser and directing a first component of the laser beam towards the workpiece and directing a second component, together with the first

component as reflected from the workpiece, to the beam splitter. Monchalin does not expressly disclose the use of a quarter wave plate disposed in the path of the first component **100a** of the laser beam **100** (and optical beam), wherein the first and second components of the laser beam correspond to the first and second components of the optical beam. However, providing a quarter wave plate in such a system is well known in the art. Alcoz in Figure 2 shows a quarter wave plate **2** provided in front of laser **1**, before the beam becomes incident on beam splitter **3**, for converting the light from the linearly polarized laser **1** to circular polarization (see Column 4, lines 15-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a quarter wave plate in the first or second optical path **100a,100b** of the modified apparatus of Monchalin, in order to impose an ideal polarization between the beams.

Regarding claim 3: The delay imposed by the delay means in the apparatus of Monchalin is not specifically taught as being greater than an inverse of the minimum signal frequency component. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to configure the delay means (e.g. fiber loop **5**, Figure 1 of Alcoz, or delay path **3,4,5,6**, Figure 2 of Alcoz) to exhibit this property, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 5: While the optical apparatus of Monchalin does not specifically teach the transmitter (laser **102**) which produces the input optical beam as being implemented in an optical communications system, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have used this component in optical communications,

since this is only a matter of intended use. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Regarding claims 6,8,18, and 19: Figure 3 of Monchalin shows a means for detecting sonic vibrations in a test material having a test surface **16** comprising a means **102** for generating a beam of light having a wavelength, a means **104** for splitting the beam into a first and second beam, and a means for directing the first beam onto the test surface **16** to be scattered by the test surface with data having a minimum signal frequency component. An adaptive beam combiner **20** combines the two multi-mode beams **100a,100b** and emits two beams, and the beams emitted by the adaptive beam combiner **20** hit respective photodetectors **124,126**, via cube polarizer **122**, and associated circuitry **128** to result in an electrical output signal that is representative of the vibrating test surface. The first and second light beams **100a,100b** are independently subjected to a polarization correcting step, via polarizers **112** and **106**, respectively, to ensure that each of the first and second beams has the same polarization as the other. Monchalin does not expressly disclose a delay means for delaying the second beam by a period of time which is greater than an inverse of the minimum signal frequency component, and therefore the first and second beams are not expressly taught as being not co-propagating and co-polarized immediately after the second beam is delayed by the delaying step. However, it is well known in the art to use delay devices for this purpose. Alcoz shows in Figure 1 a multi-mode delay fiber loop **5**, and in Figure **2** a delay path **3,4,5,6**, using beam splitter **3** and combiner **4**, for imposing a delay between the beam paths and thereby creating a predetermined phase relationship. It would have been obvious

to one having ordinary skill in the art at the time the invention was made to provide such a delay means to an optical path (**100a,100b**) of the means of Monchalin, in order to control and impose a phase-quadrature relationship.

Regarding claim 7: In the means of Monchalin shown in Figure 3, the generated beam of light from laser **102** is a polarized coherent light beam and the first and second beams **114'** and **116** are co-propagating and co-polarized when impinging the adaptive beam combiner **20**.

Regarding claims 9 and 10: The sonic vibrations on the test surface **16** of Monchalin are small vibrational surface deflections, on the order of ultrasonic surface vibrations (see *Background of the Invention* in Monchalin, as well as Column 4, lines 56-66).

Regarding claim 11: As shown by Figure 3 of Monchalin (see claim 6 rejection above for the discussion of aspects *a-c* and *e-f* of this claim), the adaptive beam combiner **20** has a receiving surface for receiving a portion of the scattered first light beam **100a** at a first angle relative to the receiving surface, and for receiving the second light beam **100b** at a second angle relative to the receiving surface, which second angle is different from the first angle, for interfering the first and second beams to introduce a phase shift difference (via the different paths and also through the delay path means provided, as taught by Alcoz) between the first and second beams, and for producing co-propagating light waves comprising at least a portion of the first and second beam received by the receiving surface.

Regarding claim 12: The apparatus of Monchalin shown in Figure 3 includes a polarization correcting apparatus consisting of polarizers **106,112**, to ensure that each of the first and second beams **100a,100b** has the same polarization as the other beam when impinging on the adaptive beam combiner.

Regarding claims 15-17: In the optical apparatus of Monchalin, the first and second components are multi-mode beams **100a,100b**, inherently having electric field amplitudes S_1 and S_2, respectively, and the two exiting optical components **114',116** from the adaptive beam combiner are beams which are respectively wavefront-matched to the first and second components **100a,100b** impinging on the adaptive beam combiner **20** (see Figure 3). The two exiting optical components are aberrated waves and in quadrature (see claim 1 rejection above, Monchalin in view of Alcoz; see also Monchalin, Column 7, lines 1-41).

Regarding claim 20: Monchalin in Figure 3 shows a means for detecting sonic vibrations in a test material having a test surface **16**, comprising: a laser **102** for generating a beam of light **100** having a wavelength, a means **104** for splitting the beam into a first and second beam **100a,100b**, respectively, and a means for directing the first beam onto the test surface **16** to be scattered by the test surface with data having a minimum signal frequency component. A portion of the scattered first beam and the second beam are directed to an adaptive beam combiner **20**, which emits two beams **114',116** having the same wavefront and propagating direction. The beams are directed onto respective photodetectors **124,126** via cube polarizing beam splitter **122** and associated circuitry **128**, to result in an electrical output signal that is representative of the vibrating test surface. Monchalin does not expressly teach providing a means for delaying the second beam by a period of time which is greater than an inverse of the minimum signal frequency component. Also, the beams exiting combiner **20** are not specifically disclosed as being in quadrature and respectively equal to the difference of the respective optical phases of the scattered first beam and the delayed second beam and the difference of the scattered delayed second and the first beam with one of the emitted beams possessing an optical wavefront

equivalent to the first scattered beam, and with the other of the emitted beams possessing an optical wavefront equivalent to the second delayed beam. With regard to imposing a delay in one optical beam path, it is well known in the art to use delay optical fibers for this purpose, as shown by Figure 1 of Alcoz, which comprises a delay optical fiber **5**. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide this delay means to one beam path in Monchalin, such that the phase relationship between the two optical beams was made to be ideal, such as in quadrature. Further it would have been obvious to configure this delay means to delay the second beam by a period of time which is greater than an inverse of the minimum signal frequency component, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). With regard to the phase difference output, it would have been obvious to configure the beam combiner **20**, optical delay fiber (e.g. **5**, Figure 1 of Alcoz) and other phase-affecting optical components in the system of Monchalin to produce beams equal to the difference as claimed, in order to provide optimal surface detection/inspection properties of the beams, through phase relationship control.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Monchalin, in view of Alcoz, as applied to claim 12 above, and further in view of U.S. Patent No. 6,057,911 to Reich. The modified means of Monchalin comprises a quarter waveplate **2** (see Figure 2 of Alcoz and claim 2 rejection appearing above), but this element is only disclosed as providing 45 degree beam rotation, and therefore does not expressly disclose providing 90 degree beam rotation. Also, a cube polarizing beam splitter **122** is shown in Figure 3 of Alcoz, but the polarization correcting apparatus (having polarizers **106,112**) of Monchalin does not specifically

teach the use of a polarization beam splitter. In regard to the 90 degree beam rotator, this is well known in the art. Figure 2 of Reich shows an optical apparatus comprising a source **106** producing a beam which is split into two separate components **110,112** by a beam splitter **108**, before being recombined by an adaptive beam splitter **118**. "The second beam **112** is directed through a ½ wave plate **116** which delays the beam so as to place it in quadrature with the first beam **110** and also rotates the polarization of the beam by 90 degrees" (Column 5, lines 36-39). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have implemented such a wave plate in the correction path of each of the two separate beam components of the modified system of Monchalin, in order to independently correct the polarization and rotate each of the beams by 90 degrees. In regard to the polarization beam splitter, the polarizers **106,112** (Figure 3, Monchalin) provided in respective optical beam paths are functionally equivalent to a single polarizing beam splitter that would handle both of these beams, in terms of ensuring that both have the same polarization. It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ a single, central beam splitter as the polarization controlling means for the beams **100a,100b** in Monchalin, since this would provide a simpler configuration requiring less components.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

U.S. Patent No. 4,996,459 to Monchalin concerns broadband optical detection of transient motion from a scattering surface. Figure 3 shows an optical apparatus for detecting ultrasonic vibration on a surface **14**, comprising a laser source **12** providing a beam which is split into two

components by splitter **142** and combined at combiner **152**. The two exiting beams **116,150** are then divided by splitting elements (e.g. **118**) and impinge on detector elements (e.g. **56,166,156'**, and **162**).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher W. Glass whose telephone number is 703-305-1980. The examiner can normally be reached 9:30am-6:00pm, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached at 703-308-4852. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

cg
January 9, 2003

STEPHONE ALLEN
PRIMARY EXAMINER